Using Geography and Geographic Information Systems to create and operate Self Sustaining Forward Operating Bases.

Terrence D. Martin

Esri

USAF Global Accounts Manager

E2S2

May 2011

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAY 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Using Geography and Geographic Information Systems to create and operate Self Sustaining Forward Operating Bases.	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Esri,380 New York Street,Redlands,CA,92373**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 9-12 May 2011 in New Orleans, LA. U.S. Government or Federal Rights License

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**17**	

Fact 13:
The American GI is the most energy consuming soldier ever seen in the field of war.

- 15 Gal/Day of fuel/deployed soldier
  - Energy is our advantage
- $400/Gal. fully burdened cost of fuel
  - Energy is our weakness
  - The Energy Fight: This tactic involves building and energy advantage and then converting that energy to a snapshot position. (Fighter Combat: tactics and maneuvering, R.L. Shaw)
  - CNO (ADM Gary Roughead): When I was a commander, I had a sign put over every one of my air controllers that simply said, “think gas.” You can’t operate in that environment with those types of machine and not always have your mind on the source of energy and power. We have to be able to look at ways to extend the capability, the capacity, the duration of the machines that we operate.

New Reality

- Air Combat Related Aerodynamics: The concept of energy awareness is fairly new. Wise use and conservation of energy during combat will increase your chances of victory. (Official F-15 Strike Eagle Handbook)

- DoD and its allies can become an even more powerful force when we learn to use energy strategy as yet another arrow in our quiver. Dan Nolan (DoD Energy Blog)

Climate Change and Military Energy Requirements

- Climate change yields destabilization in a geographically predictable way
- Destabilization yields conflict in a geographically predictable way
- Conflict yields deployment to that geography
- Geography dictates forward basing location options
- Geography dictates energy requirements (lighting, heating, cooling, mobility, security, logistics)
- Geography dictates energy conservation options (insulation, swamp coolers, supply options)
- Geography dictates energy options (oil, wind, solar, hydro, geothermal, biomass, etc.)
- Plan with geography to maximize military advantage in future deployments

Expeditionary Site Selection Process (today):

Headquarters Air Combat Command

Expeditionary Site Mapping (ESM) Application

Mark Cave
USAF ACC IGI&S
Contractor - AECOM, Inc.
ESRI FEDUC
February 2010

This Briefing is:
UNCLASSIFIED

CSAF Requirement

ESM - Global Mobility Support

- Global Mobility Concept of Operations calls for capability to:
  - Provide assets around the globe anytime, anywhere
  - Provide tailored capabilities to stand-up and sustain combat operations at prepared and austere locations
  - Capability to rapidly assess an airbase
  - Perform pre action assessments
  - Plan base layout

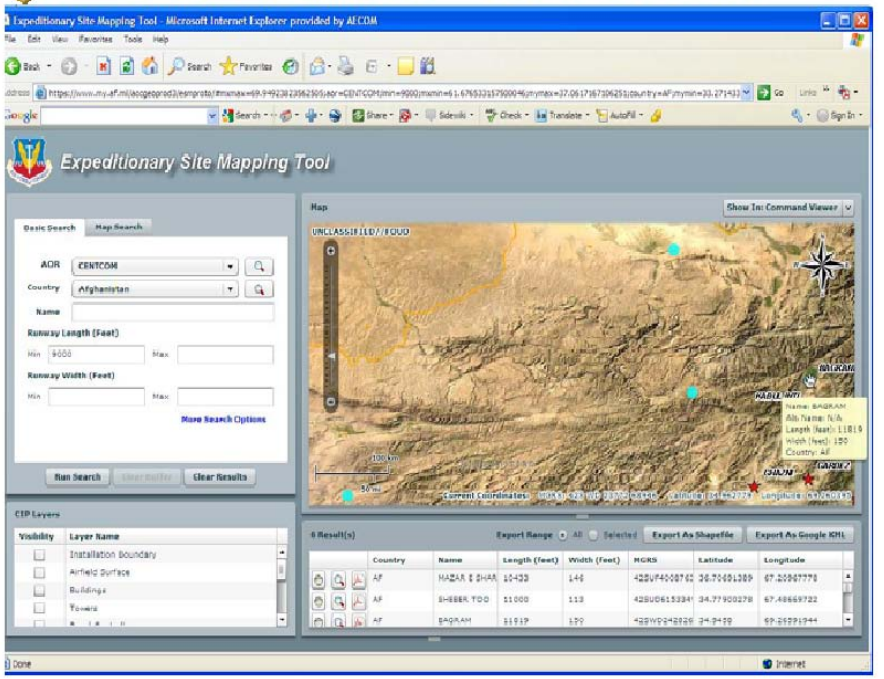
"Collect/update data on runway and base infrastructure from airfields, remote and en-route to provide runway and basing capability and capacity, at frequent intervals prior to crisis development. Perform pre-action assessment. Maintain Worldwide awareness of airfield capabilities to support mobility operations" Para 5.1.1.2.1, GM CONOPS

GeoReach Program

Expeditionary Site Mapping
Sequenced Actions

Air Expeditionary Forces Strategic Doctrine

User Features – Basic Search



Sustainable Expeditionary Site Selection Process:

Headquarters Air Combat Command

Expeditionary Site Mapping (ESM) Application

Mark Cave
USAF ACC IGI&S
Contractor - AECOM, Inc.
ESRI FEDUC
February 2010

This Briefing is:
UNCLASSIFIED

CSAF Requirement

ESM - Global Mobility Support

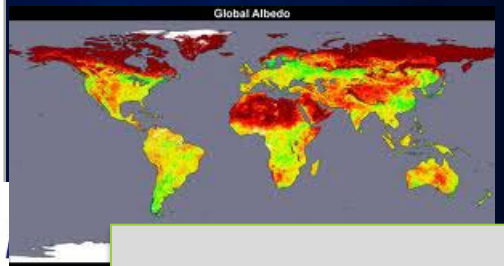
- Global Mobility Concept of Operations calls for capability to:
  - Provide assets around the globe anytime, anywhere
  - Provide tailored capabilities to stand-up and sustain combat operations at prepared and austere locations
  - Capability to rapidly assess an airbase
  - Perform pre action assessments
  - Plan base layout

"Collect/update data on runway and base infrastructure from airfields, remote and en-route to provide runway and basing capability and capacity, at frequent intervals prior to crisis development. Perform pre-action assessment. Maintain Worldwide awareness of airfield capabilities to support mobility operations" Para 5.1.1.2.1, GM CONOPS

Air Expeditionary Forces Strategic Doctrine

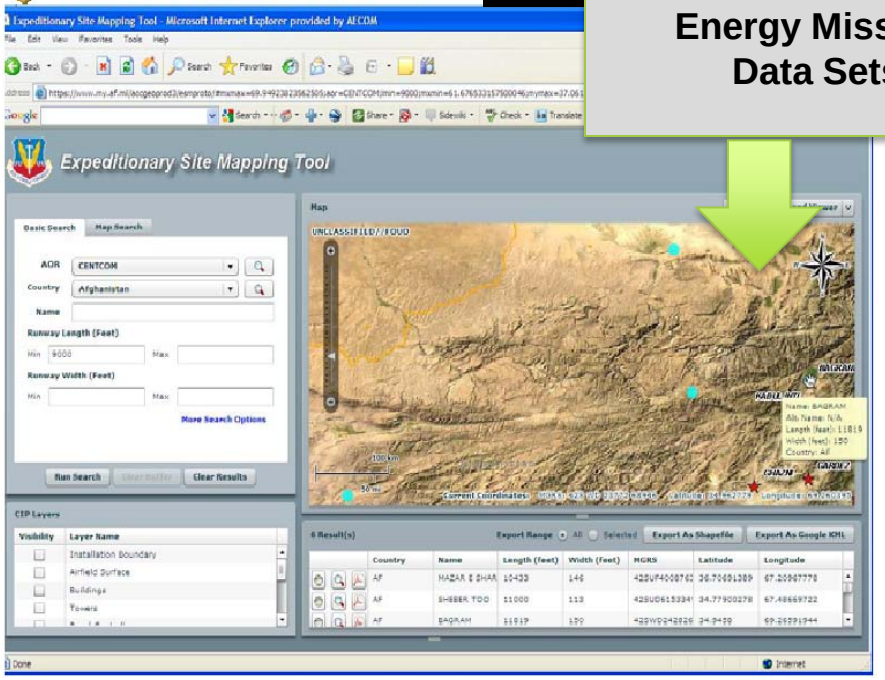
GeoReach Program

Sustainability Function



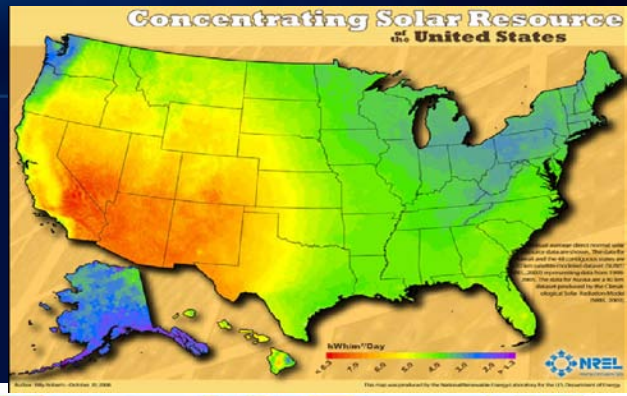
Energy Mission Data Sets

User Features –



Sustainable Expeditionary Site Selection Requirements:

- Mission Data Set:
- Solar Density
- Wind Density
- Biomass Resources
- Geothermal Resources
- Hydro Resources
- Tidal Resources
- Etc.



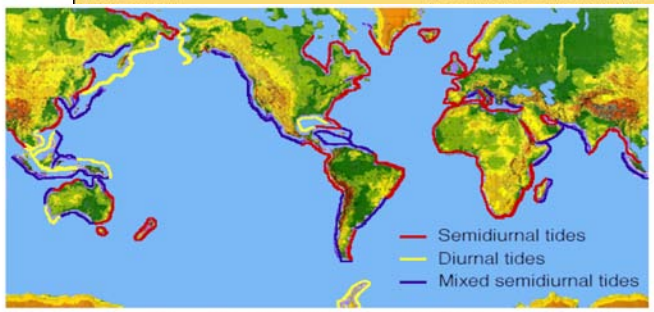


Figure 1-3 Global Distribution of Tidal Regimes

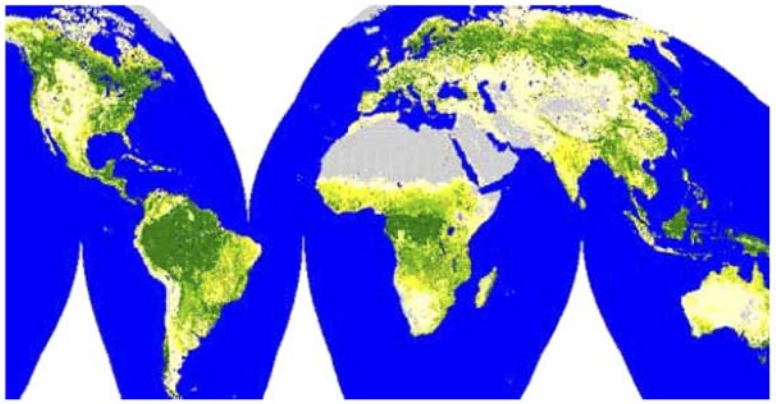
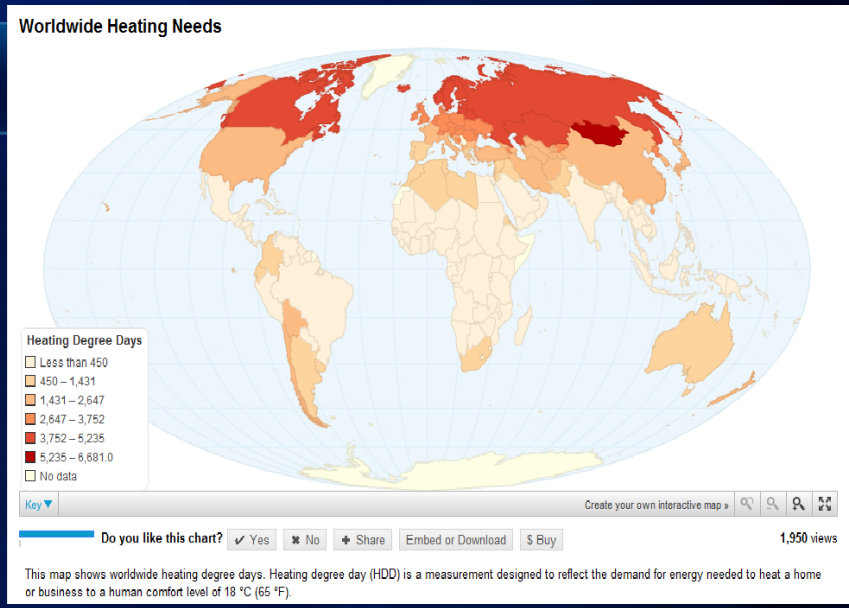
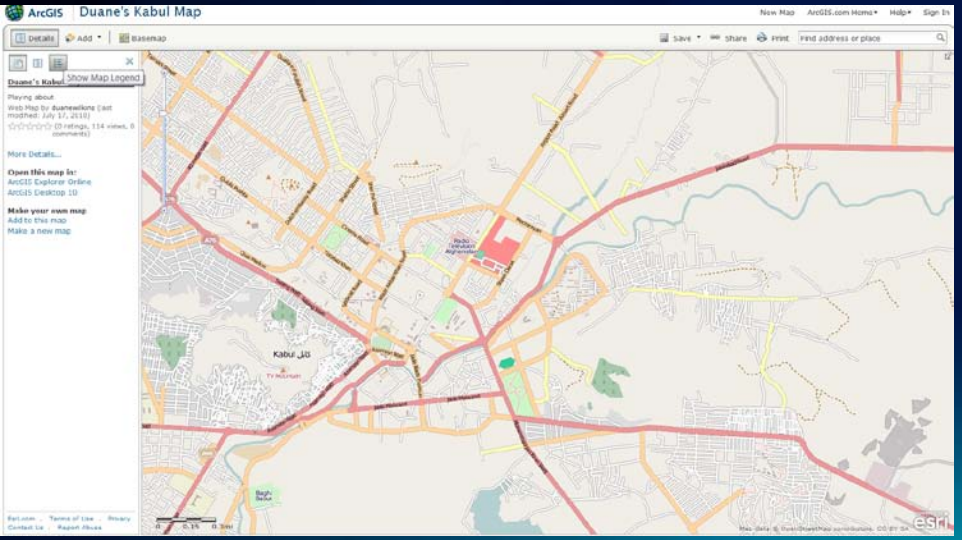


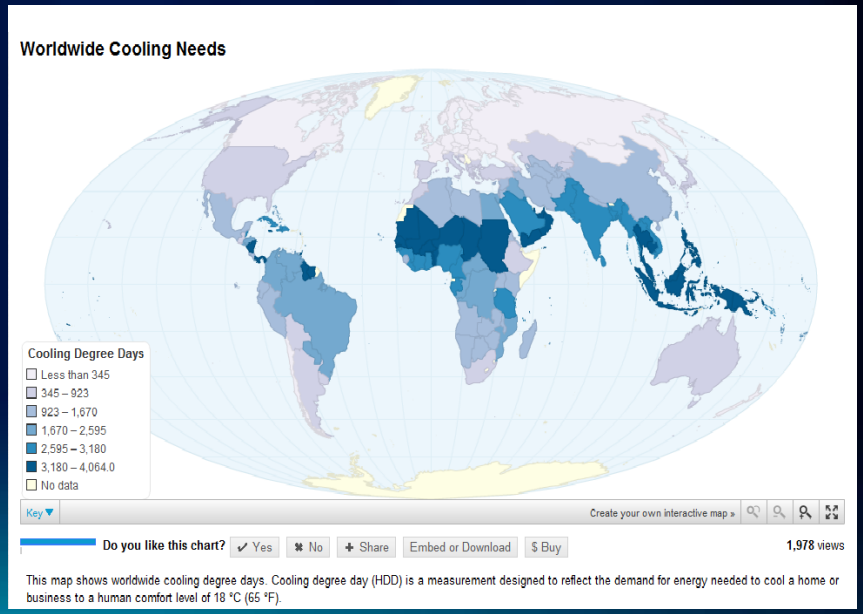
Fig. 1. Global Tree Cover in percent (white: 0%; dark green: 100%) retrieved from NOAA AVHHR (from DeFries et al., 2000). Uncertainties exist for global forest cover estimates (between 30 and 60 Mio km^2) and carbon stored in different types of forests (stock ranges from 100 to 400 tC/ha with biome). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

Sustainability Mission Data Set

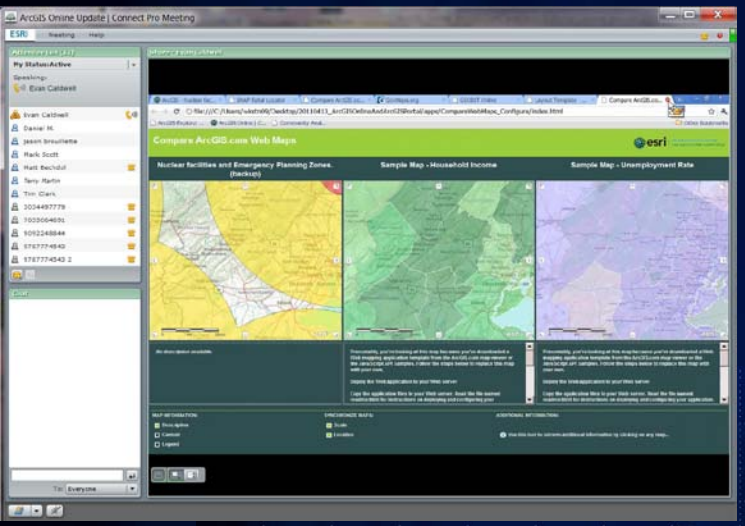
- Degree Heating Days
- Degree Cooling Days
- Rainfall Patterns
- Roads (supply lines)
- Mobility
- Refineries
- Ports







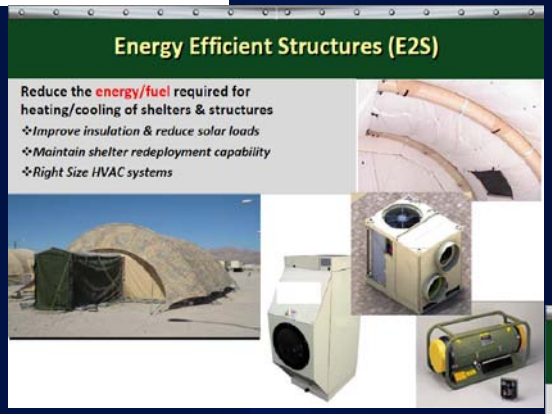
Existing technology and functionality already deployed….just adding capabilities

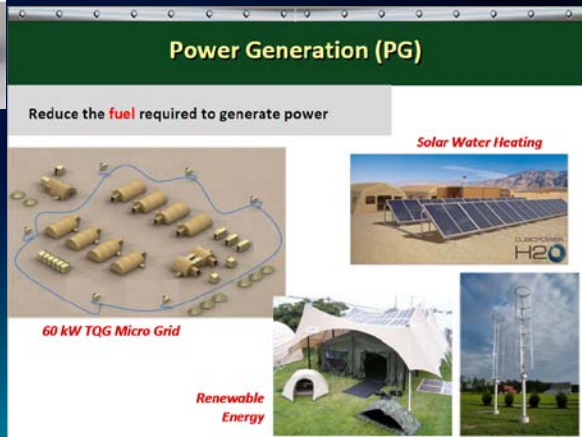


Application Components

- Adobe Flex API
  - Adobe Flash
- Leverages ACC Architecture
  - ESRI ArcGIS Server 9.3.1 Cache Tiles
  - ESRI ArcSDE Single Schema & Database Replication
  - DISA Global Information Grid (GIG) Content Delivery Service
    - Edge Serving
    - Performance Bursting
- Global Combat Support System – AF (Unclass only)
  - Security Services
    - Role Based access control for need to know
  - AF Portal Reduced Sign
    - .com & .mil access vi

Matching site requirements to site capabilities:





Matching wind generators to wind density

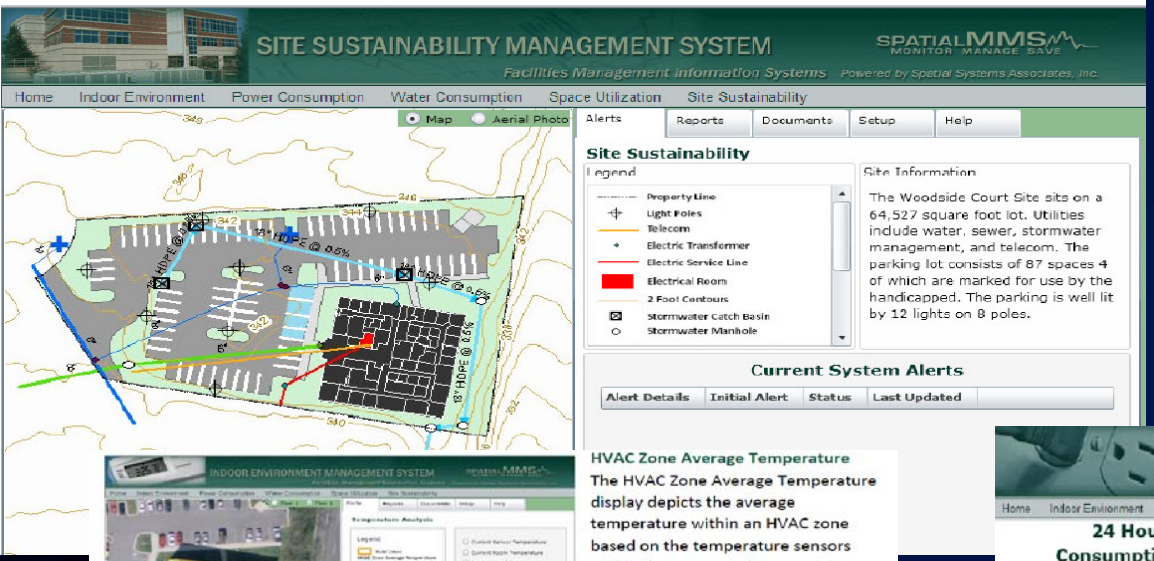
Matching solar panels to solar density

Scaling systems to geographic needs for heating days cooling days…

Optimizing Base Operations:

Site Sustainability

The Site Sustainability portion of SpatialMMS is tailored to track the information necessary for USGBC building certification and for facility operations. When the user selects the Site Sustainability pull-down from the main page, the following screen is displayed:

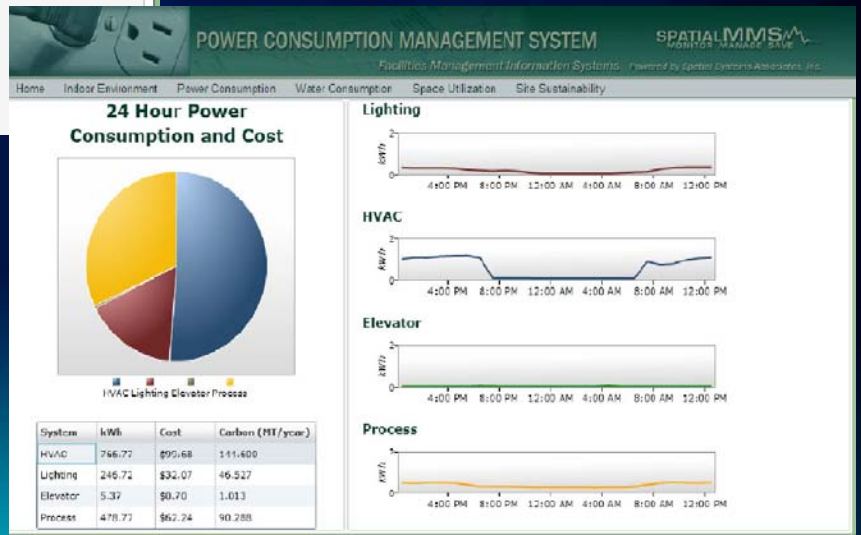


HVAC Zone Average Temperature

The HVAC Zone Average Temperature display depicts the average temperature within an HVAC zone based on the temperature sensors within that zone. In this case, it is evident that the entire second floor is within a common range of 68-76 degrees, which is where an operations manager would probably want it to be.

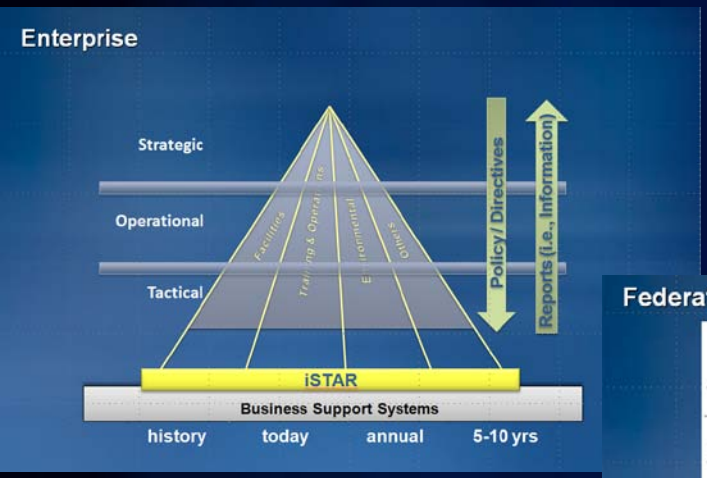
HVAC Zone Out of Range

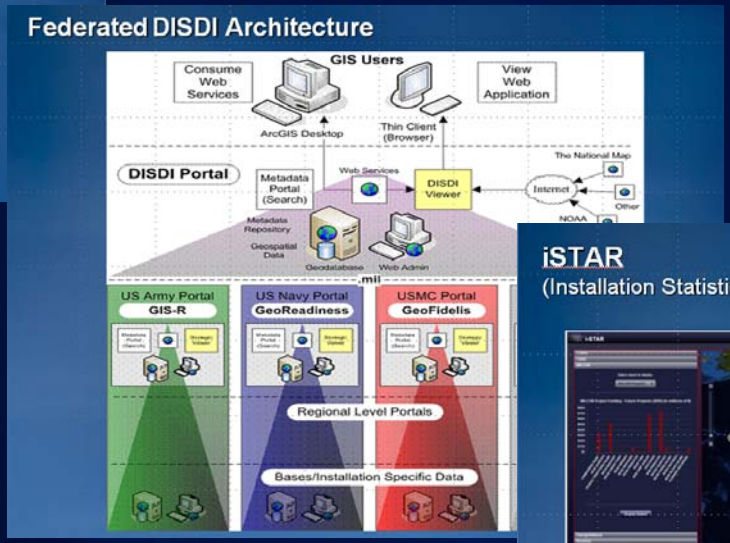
This graphic depicts color coding of the individual zones as a function of the temperature sensor acceptability range. If any sensor within the HVAC zone is too hot, then it is assumed the entire zone is too hot and the zone is depicted in red. If any sensor within the HVAC zone is too cold, then the entire zone is depicted in blue. If any one sensor is too hot and another



Linking Industrial Control Systems, Meters, Sensors to provide Situational Awareness and Operational Controls in 4 dimensions

Optimizing Theatre Operations:





Technology
Empowering the warfighter:
More tooth
Less tail

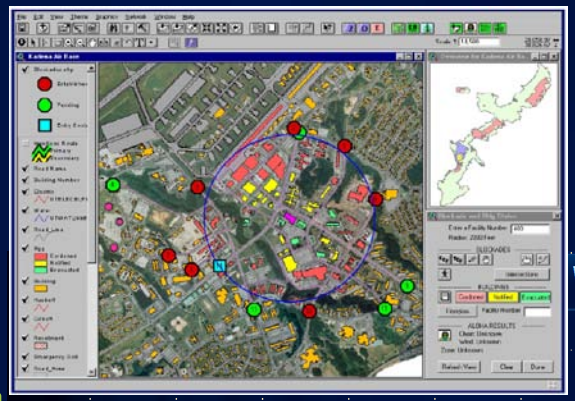
Key Points:

- Climate Change cause and effects are Geographically predictable
- In other words: Sustainability is a geographically organized problem in space and time
- GIS is a tool for managing geographically organized problems
- Where and how to deploy are geographic problems
- GIS technology is already deployed (CJMTK, GeoBase, Expeditionary Site Selection tool, Defensor Fortis, GeoFidelis, Enterprise Licenses USACOE…)
- Applying GIS to the problem of Sustainable Forward Operating Bases is underway
- This approach is consistent with Energy Savings, Sustainability Goals, EMS, Transparency, and Cost Savings

A Complete System for sustainable OPS

Mission Support

Easier
More Powerful
and Everywhere



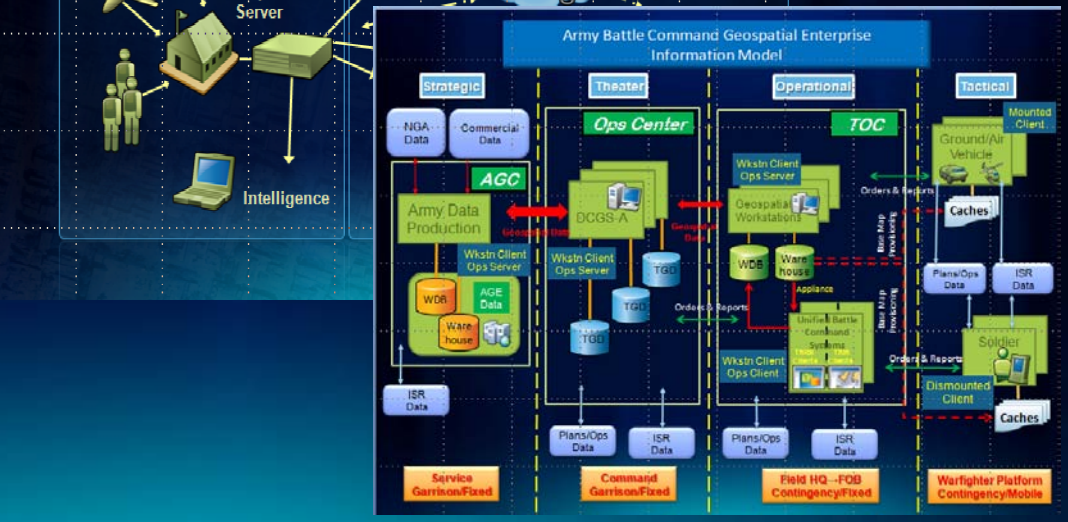
Warfighter

ISR Programs
(DCGS-A)

C2 Programs
(CPOF...AFATDS...FBCB2/JCR/JBC-P)

Sensors
Common Geospatial Server
Intelligence
COP
Mounted

Enterprise



Questions?

Contact Information:

Terrence D. Martin
Esri
US Air Force Global Accounts Manager

tmartin@esri.com

978 777 4543 x8430


esri